

REMARKS

The applicants thank the examiner for his time during the telephonic interview. In response to the telephonic interview, applicants respectfully request reconsideration of the rejection of the claims in view of the claim amendments as well as the remarks set forth below. Claims 1-22 remain in the application. Claims 1, 9, and 17 are currently amended. Claims 2-8, 10-16, and 18-22 were previously presented.

35 U.S.C. §103

Claims 1, 9, 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Raphaeli (US6466613) in further view of Shiraishi (US6975691). Under 35 U.S.C. § 103, the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to be obvious in light of the teachings of the references (MPEP § 706.02(j)).

The applicants respectfully traverse the rejection and submit the following arguments for consideration by the examiner. Claim 1 recites, inter alia, a "digital radio frequency (RF) transceiver circuit, comprising . . . a converter circuit that samples a receiver input signal . . . circuitry that is adapted to select between a transmitter input signal and the sampled receiver input signal, the transmitter input signal including a real portion and an imaginary portion . . . a filter, the filter being adapted to receive both the transmitter input signal and the sampled receiver input signal, the filter adapted to produce either a filtered transmitter signal or a filtered receiver signal, the filter further including at least two filter elements operating in parallel . . . and circuitry that alternatively receives the filtered transmitter signal or the filtered receiver signal and produces a modulated output and a demodulated output, the demodulated output including a real portion and an imaginary portion, wherein the filter operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output." (emphasis added). The applicants propose that neither Raphaeli nor Shiraishi, taken alone or in combination, show or suggest all of the elements of claim 1.

Raphaeli appears to be directed at a communications transceiver that includes a bandpass filter that is switched between a receiving circuit and a transmitting circuit. A control signal allows the bandpass filter to connect between the receiver input and the A/D converter for the receiver circuitry or the D/A converter for transmitter circuitry and the transmitter output.

In contrast, claim 1 includes a filter that “includes at least two filter elements operating in parallel” and “wherein the filter operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output “. The filter that “includes at least two filter elements operating in parallel” and wherein the “filter operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output” elements of claim 1 are an important aspect of the invention. The background of the invention discusses the desire to reduce the complexity associated with the circuitry for modulating and demodulating signals (page 2 lines 25-28) and additionally, the lower complexity allows for more efficient power consumption (page 6 lines 14-15). The importance of these aspects of the invention is further emphasized in that the filter receives a transmitter input signal, “ the transmitter input signal including a real portion and an imaginary portion” and that a circuit receives the “filtered receiver signal and produces . . . a demodulated output, the demodulated output including a real portion and an imaginary portion.”

As acknowledged in the Office Action, Raphaeli does not disclose that the filter sampling frequency is lower than the converter sampling frequency element of claim 1. Further, the applicants propose that the Raphaeli filter is not a filter that “includes at least two filter elements” and wherein the filter “operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output”. Indeed, Raphaeli appears only to recognize using an analog filter that does operate using a sampling frequency at all, let alone a frequency related to other circuitry in the transceiver, such as the A/D converter in the receiving circuit. As a result, Raphaeli does not show or suggest at least the filter that “includes at least two filter elements operating in parallel” and “wherein the filter operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output” elements of claim 1.

Shiraishi is relied on in the Office Action to overcome the deficiencies in Raphaeli. Shiraishi appears to be directed at a receiver circuit for digitally modulated signals. The receiver circuit includes among other things a pair of multipliers, a pair of A/D converters, a pair of digital filters, and a pair of thinning circuits for processing a received signal as an in phase and quadrature signal set. (FIG. 10). More specifically, the A/D converters convert the multiplier outputs at a rate that is 2 times faster than the symbol rate. The digital filters, each of which are connected to a single A/D converter, limit the bandwidths of the signals from the A/D converters. (Col. 2, lines 19-23.) The thinning circuits, which are connected to the filters, thin the outputs of the filters at a half of the sampling rate of the A/D converters. (Col. 2, lines 23-26.)

As noted above, claim 1 includes a filter that “includes at least two filter elements operating in parallel” and “wherein the filter operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output “. The Shiraishi filters are single filters that appear to operate at the same frequency as the A/D converters for the receiver. It appears instead that the thinning circuits, and not the filters, operate at a sampling rate that is different from the sampling rate of the A/D converters and the filters. The Shiraishi single filters that operate at the same frequency as the A/D converters are not the same as the filter in claim 1, that “includes at least two filter elements operating in parallel” and “wherein the filter operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output”.

Further, it appears that the Shiraishi filters only operate as part of a receiving circuit. Shiraishi appears notably silent with respect to any teaching of the operation of a filter in conjunction with circuitry that produces a modulated output. As a result, the Shiraishi filters do not appear to be a filter that “operates at a sampling frequency that is lower than the sampling frequency of the converter and the circuitry that produces the modulated output”.

As a result, neither Raphaeli nor Shiraishi, taken alone or in conjunction, show or suggest all of the elements of claim 1. Therefore it is respectfully proposed that the rejection of claim 1 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Amended claim 9 includes limitations similar to the elements of claim 1 and should therefore be allowable for that reason as well as the additional recitations contained therein. Therefore it is respectfully proposed that the rejection of claim 9 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Amended claim 17 includes limitations similar to the elements of claim 1 and should therefore be allowable for that reason as well as the additional recitations contained therein. Therefore it is respectfully proposed that the rejection of claim 17 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Claims 3, 8, 11, 16, and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Raphaeli in further view of Shiraishi in view of Beck et al (US2002/01091825). Dependent claim 3, being dependent on and further limiting independent claim 1, should be allowable for that reason as well as the additional recitations that it contains. Therefore it is respectfully proposed that the rejection of claims 3 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Dependent claim 8, being dependent on and further limiting independent claim 1, should be allowable for that reason. Furthermore, claim 8, recites, among other things, the “RF transceiver circuit set forth in claim 1, wherein the receiver input signal is processed with a delay line having a plurality of output delays, each of the output delays corresponding to one of the plurality of filters and wherein each of the plurality of filters has a different delay characteristic that compensates the associated output delay.” The applicants propose that none of the references, Raphaeli, Shiraishi, and Beck, taken alone or in combination, show or suggest at least the “wherein the receiver input signal is processed with a delay line having a plurality of output delays, each of the output delays corresponding to one of the plurality of filters and wherein each of the plurality of filters has a different delay characteristic that compensates the associated output delay” element of claim 8.

As acknowledged in the Office Action, neither Raphaeli nor Shiraishi disclose a delay chain in detail. Beck is relied on in the Office Action to overcome the deficiencies in

Raphaeli and Shiraishi. Beck appears to be directed at a system that employs a transmitter and receiver for estimating transmission channel characteristics. More specifically, the receiver in Beck employs an FIR filter. (FIG. 1 and paragraphs 0028-0029.) The FIR filter is a conventional structure that employ individual delay elements between multipliers with the outputs of the multipliers summed together using adders to produce a single output. (paragraph 0030).

In contrast, claim 8 includes a receiver circuit, “wherein the receiver input signal is processed with a delay line having a plurality of output delays, each of the output delays corresponding to one of the plurality of filters and wherein each of the plurality of filters has a different delay characteristic that compensates the associated output delay.” The single conventional FIR filter in Beck is not the same as the delay having a plurality of delays, each of the delays corresponding to one of the plurality of filters, wherein each of the plurality of filters has a different delay characteristic that compensates the associated output delay. As a result, Beck does not overcome the deficiencies in Raphaeli and Shirasihi. As a result, Raphaeli, Sharaishi, or Beck taken alone or in conjunction, do not show or suggest at least the “wherein the receiver input signal is processed with a delay line having a plurality of output delays, each of the output delays corresponding to one of the plurality of filters and wherein each of the plurality of filters has a different delay characteristic that compensates the associated output delay” element of claim 8. Therefore it is respectfully proposed that the rejection of claim 8 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Dependent claims 11 being dependent on and further limiting independent claim 9, should be allowable for that reason as well as the additional recitations that they contain. Therefore it is respectfully proposed that the rejection of claims 11 and 16 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Dependent claim 16 includes limitations similar to the elements of claim 8 and should therefore be allowable for that reason as well as the additional recitations contained therein. Therefore it is respectfully proposed that the rejection of claim 16 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Dependent claim 19, being dependent on and further limiting independent claim 17, should be allowable for that reason as well as the additional recitations that they contain. Therefore it is respectfully proposed that the rejection of claim 19 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Claims 5-7, 13-15, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Raphaelli in further view of Shiraishi in view of Webster, et al (US2003/0058952). Dependent claims 5-7, being dependent on and further limiting independent claim 1, should be allowable for that reason as well as the additional recitations that they contain. Therefore it is respectfully proposed that the rejection of claims 5-7 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Dependent claims 13-15, being dependent on and further limiting independent claim 9, should be allowable for that reason as well as the additional recitations that they contain. Therefore it is respectfully proposed that the rejection of claims 13-15 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Dependent claim 20, being dependent on and further limiting independent claim 17, should be allowable for that reason as well as the additional recitations that they contain. Therefore it is respectfully proposed that the rejection of claim 20 under 35 U.S.C. § 103(a) is overcome in accordance with the above remarks and notice to that effect is earnestly solicited.

Allowable Subject Matter

Applicants respectfully note that claims 2, 4, 10, 12, and 18 were deemed to be allowable if rewritten in independent form including the limitations of the base claim and any intervening claims. Applicants also respectfully note that claims 21 and 22 are allowed.

Conclusion

Having fully addressed the Examiner's rejections it is believed that, in view of the preceding remarks, this application stands in condition for allowance. Accordingly then, reconsideration and allowance are respectfully solicited. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the applicants' agent at (317) 587-4027, so that a mutually convenient date and time for a telephonic interview may be scheduled.

No additional fee is believed due in regard to the present amendment. However, if an additional fee is due, please charge the fee to Deposit Account 07-0832.

Respectfully submitted,

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